ROBUSTNESS AND ACCURACY ASSESSMENT OF INVISIBLE WATERMARKING OVER GEOSPATIAL VECTOR DATA

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Abstract: Geospatial vector data acquisition and generation is very complex and expensive task and it needs to be protected from unauthorized users. The motive behind watermarking of geospatial vector data is to stop illegal distribution, forgery, and tampering of valuable geospatial data. This technique also helps in data source tracing and authentication. Watermarking algorithm used for copyright protection of geospatial data can vary according to its characteristics. The requirements for vector data watermarking are: (1) Good robustness against attacks; (2) Invisible watermarking scheme; (3) Precision and positional accuracy retention; (4) Topological relationship preseverance. All these requirements are taken into consideration while designing and evaluating the proposed algorithm. In this paper, we have considered distinctive characteristics of geospatial vector data and proposed wavelet based invisible watermarking algorithm. We have utilized third level low frequency wavelet coefficients for embedding binary image watermark multiple times with different embedding amplitudes.

We have used different polyline and polygon geospatial vector data to embed the watermark. Haar wavelet was used in our experimentation. We have examined the watermarked geospatial vector data against various attacks and conventional accuracy assessment as well as specialized geospatial vector data quality assessment measures. The proposed method results out in less distortion. It is observed that error increases as embedding amplitude increases. Also, it has good

robustness against noise, vertex addition/deletion, translation, scaling, format change and cropping attack. For different embedding strengths, topological relations are checked for watermarked vector data. The topological rules “must not intersect”, “must not self-intersect”, “must not overlap”, “must not have dangles” and “must not have gaps” are used for contour polyline, polygon, and road segment vector data respectively. It has been observed that the proposed method retains topological relations for smaller values of embedding amplitude.